3.3.5.1 Boreal Forest

3.3.5.1.1 Community Overview

Mature stands of this upland forest community are dominated by white spruce and balsam fir, often mixed with white birch, northern white cedar, eastern white pine, eastern hemlock (within its range), balsam-poplar, and quaking aspen. Mountain-ash may also be present. Common understory herbs are large-leaved aster, blue-bead lily, Canada mayflower, wild sarsaparilla, and bunchberry. Most Wisconsin stands are associated with the Great Lakes, especially the clay plain of Lake Superior, and the eastern side of the northern Door Peninsula on Lake Michigan. The boreal forest in Wisconsin is transitional between the mixed deciduous-conifer forests to the south and the spruce-fir dominated forests of Canada, so tree species richness is often greater here. Of potential interest from the perspectives of vegetation classification and restoration, eastern white pine had the highest importance value of any tree in the Lake Superior region, as recorded during the original land survey of the mid-1800's.

3.3.5.1.2 Vertebrate Species of Greatest Conservation Need Associated with Boreal Forest

Eighteen vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with boreal forest (Table 3-112).

Table 3-112. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with boreal forest communities.

Species Significantly Associated with Boreal Forest
Birds
Veery
Canada Warbler
Mammals
Water Shrew
Northern Flying Squirrel
Gray Wolf
American Marten
Moose
Species Moderately Associated with Boreal Forest
Birds
Northern Goshawk
Spruce Grouse
Black-backed Woodpecker
Olive-sided Flycatcher
Least Flycatcher
Boreal Chickadee
Herptiles
Four-toed Salamander
Mammals
Silver-haired Bat
Eastern Red Bat
Hoary Bat
Woodland Jumping Mouse

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-112 were subject to further analysis. The additional analysis identified the best

opportunities, by Ecological Landscape, for protection, restoration, and/or management of both boreal forest and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of boreal forest in each of the Ecological Landscapes (Tables 3-113 and 3-114).

- Using the analysis described above, a species was further selected if it had both a significant association with boreal forest and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of boreal forest. These species are shown in Figure 3-23.

Table 3-113. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with boreal forest communities and their association with Ecological Landscapes that support boreal forest.

Boreal Forest	Birds (2)*		Mammals (5)				
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Veery	Canada Warbler	Water Shrew	Northern Flying Squirrel	Gray Wolf	American Marten	Moose
MAJOR							
Superior Coastal Plain							
IMPORTANT							
North Central Forest							
Northern Lake Michigan Coastal							
Northwest Lowlands							
PRESENT (MINOR)							
Northeast Sands							
Northern Highland							

Color Key

= **HIGH probability the species occurs in this Ecological Landscape**

= **MODERATE probability the species occurs in this Ecological Landscape**

= **LOW or NO probability the species occurs in this Ecological Landscape**

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Table 3-114. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with boreal forest communities and their association with Ecological Landscapes that support boreal forest.

Boreal Forest	Birds (6)*						Herptiles (1)	Mammals (4)			
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Northern Goshawk	Spruce Grouse	Black-backed Woodpecker	Olive-sided Flycatcher	Least Flycatcher	Boreal Chickadee	Four-toed Salamander	Silver-haired Bat	Eastern Red Bat	Hoary Bat	Woodland Jumping Mouse
MAJOR											
Superior Coastal Plain											
IMPORTANT											
North Central Forest											
Northern Lake Michigan Coastal											
Northwest Lowlands											
PRESENT (MINOR)											
Northeast Sands											
Northern Highland											

Color Key

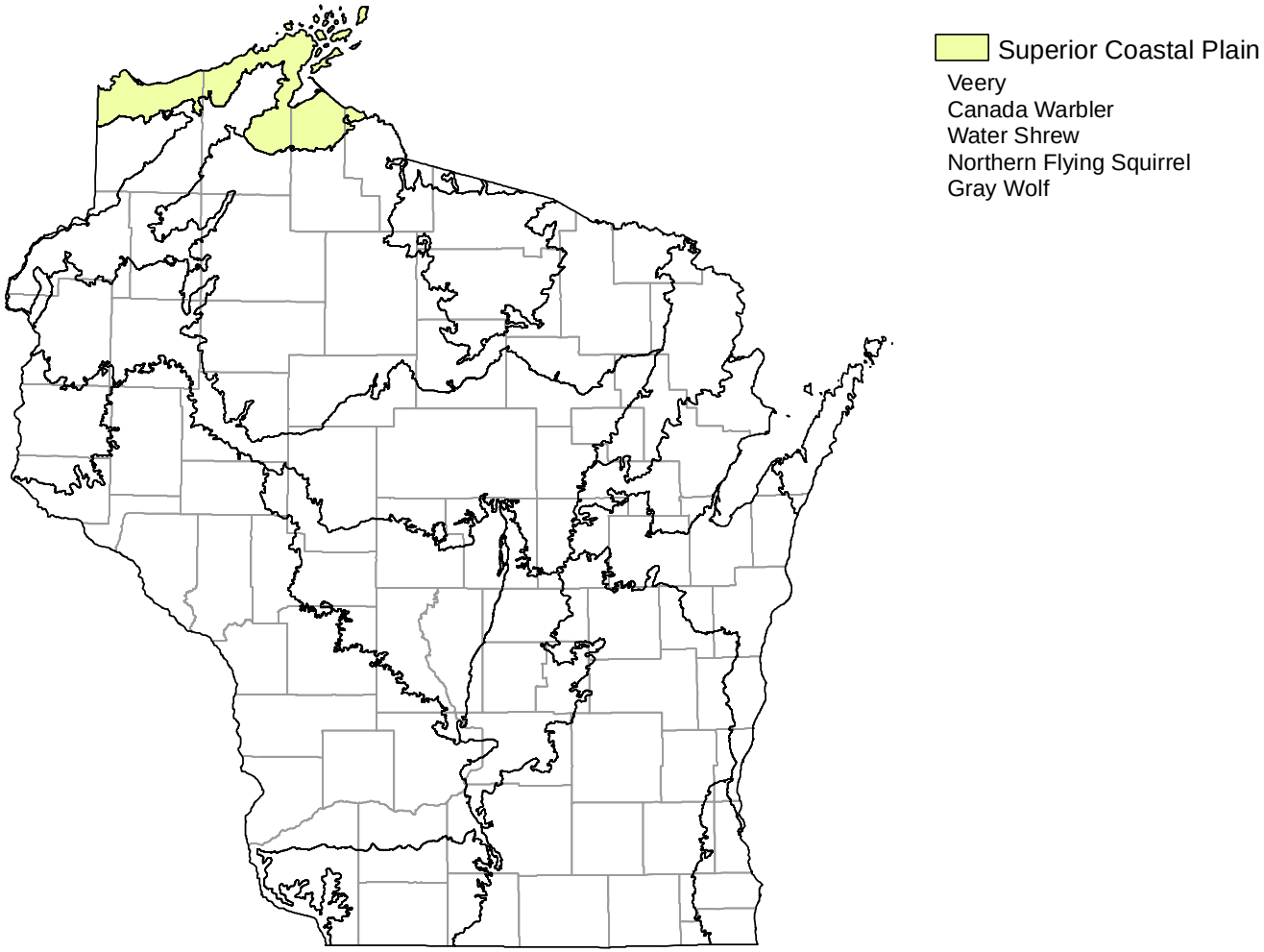
= **HIGH probability the species occurs in this Ecological Landscape**

= **MODERATE probability the species occurs in this Ecological Landscape**

= **LOW or NO probability the species occurs in this Ecological Landscape**

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Figure 3-23. Vertebrate Species of Greatest Conservation Need that have ***both* a significant association with boreal forest ***and*** a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of boreal forest.**



3.3.5.1.3 Threats and Priority Conservation Actions for Boreal Forest

3.3.5.1.3.1 Statewide Overview of Threats and Priority Conservation Actions for Boreal Forest

The following list of threats and priority conservation actions were identified for boreal forest in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.5.1.3.2 unless otherwise indicated.

Threats and Issues

- Changes in hydrology due to road and other right-of-way construction have been detrimental.
- Past and current land use practices (e.g., Cutover-era logging, intense burning, agriculture) have resulted in loss and conversion (to aspen) of much of the type.
- High deer populations are responsible for herbivory that limits regeneration of shrub and ground flora, including Canada yew, and important canopy species such as northern white cedar, eastern hemlock, eastern white pine, and balsam fir.
- Some cedar stands have been managed as deeryards, resulting in long-term damage.
- In some instances, flooding by beaver has converted these types to alder and/or black ash.
- Unsustainable forest management practices can result in soil compaction, rutting, erosion and water quality issues, or conversion of the type.
- Reliable regeneration techniques are lacking. Regeneration problems are occurring in all Ecological Landscapes where the type occurs, due in part to excessive browse pressure, and successful management of this type over the long-term will need to take landscape factors into account (especially the density and distribution of white-tailed deer).
- Invasive species can be a problem in some areas (e.g., glossy buckthorn, Asian honeysuckles, European swamp and Canada thistles, moneywort, garden heliotrope, creeping Charlie, and garlic mustard).

Priority Conservation Actions

- Increase representation of conifers such as white spruce, northern white cedar, eastern white pine, and balsam fir where feasible. Selective planting may be necessary in some areas.
- Reduce forest fragmentation by increasing forest patch size, increasing the proportion of interior to edge, and avoiding the placement of clearcuts in the immediate vicinity of stands with high conservation value or restoration potential.
- Reduce deer density where possible.
- Provide for older forest developmental stages where they are missing.
- Reduce beaver density and/or increase predator populations in problem areas.
- Use watershed-level planning and management to reduce impacts of conversion on water quality.
- Apply Best Management Practices for water quality during forest harvesting operations.
- Emphasize land management that incorporates protections against the introduction of invasive species.

3.3.5.1.3.2 Additional Considerations for Boreal Forest by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of boreal forest exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for boreal forest found in Section 3.3.5.1.3.1.

Additional Considerations for Boreal Forest in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management of Boreal Forest

Superior Coastal Plain

This Ecological Landscape represents the best opportunity to restore some areas to this community type, and to encourage species that have been reduced in abundance since the Cutover (e.g., eastern hemlock, Canada yew, northern white cedar). The clay soils require careful management to avoid damage from heavy equipment and possible "swamping" following timber harvest. Drainages containing this type are also susceptible to being dammed by beaver. A change in management focus would be needed to reintroduce and favor the conifer component. Older stands dominated by boreal conifers are scarce and usually small. Examples of this community occur on the Superior Municipal Forest (Douglas County), the northernmost portions of the Brule River State Forest (Douglas County), and Port Wing Boreal Forest State Natural Area (Bayfield County). The type may also be found in Ashland County on the Reservation of the Bad River Band of Lake Superior Ojibwa (which is not open to visitation without the express permission of the tribe).

Additional Considerations for Boreal Forest in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management of Boreal Forest

North Central Forest

Boreal forest patches occur locally in cool, moist depressions at scattered locations throughout this Ecological Landscape. Cold air drainage may be a factor that contributes to the maintenance of this community in a landscape that is much more amenable to other forest types. Among the few examples are Flambeau River Pines and Boreal Forest (western Iron County), Bear Lake Hardwoods and Boreal Forest (Ashland County Forest), and scattered, very small sites on the Chequamegon-Nicolet National Forest, such as the Charlie Otto Springs (Forest County).

Northern Lake Michigan Coastal

Occurrences of boreal forest are found along the Lake Michigan side of the northern Door Peninsula, in a thin strip well under one mile wide, paralleling the shore just inland from the open rock pavement and shrub zone along the lake. In this Ecological Landscape, the community is associated with highly localized lake effect climate that contributes to cooler temperatures, and thin soils over dolomite bedrock. The conifer component of these forests is mixed, sometimes dominated by northern white cedar, or by spruce and fir, with representation of eastern white pine. Deer browse is severe in many forested areas here. Of special conservation interest are the many rare species, and high diversity of conifer-associated wood warblers, that occur here. Though the type is very limited in extent, good examples occur at Toft Point, Marshall's Point, and Moonlight Bay Bedrock Beach (all State Natural Areas in Door County).

Northwest Lowlands

Boreal forest patches typically occur in moist depressions between ridges in this Ecological Landscape. Compositionally, they are similar to boreal forests of the Superior Coastal Plain Ecological Landscape, but lack some of the understory species that are common in the Superior Coastal Plain, as well as eastern hemlock, as this Ecological Landscape is outside of its range. The relatively low road density in these forests affords one of the best remaining opportunities for species that prefer solitude. Erickson Creek State Natural Area (Douglas County) and several of the large intact peatlands nearby (e.g., Black Lake and Empire Swamp), contain examples of second-growth northern hardwoods and/or aspen-birch forests that sometimes have good representations of balsam fir and white spruce in the understory.